31 PRTS

10/531256

1/7

8410 PCT - WEB

JC13 Rec'd PCT/PTO 13 APR 2005

Windmöller & Hölscher KG
Münsterstrasse 50
49525 Lengerich/Westfalen

December 3, 2003

Our Reference: 8410 PCT – WEB

Bag-making device

The invention concerns a bag-making device for cross base bags as is presented in the generic term of claim 1.

These devices are known since long and are acknowledged e.g. in the document DE 198 05 321 C1. In more recent times, there has been an increasing demand for cross base bags with small volumes. Cross base bags can have a small volume by means of a smaller base middle measurement. However, the manufacture of bags with smaller base middle measurement requires the implementation of extensive constructive changes in the means of production, primarily in bag making devices. Since the bags are conveyed at right angles to the principal axis of the tube through the working station of the bag-making device, both the working stations and also the conveyor system have to be formed narrower than they used to be so far.

One of the necessary measures is the use of narrower conveyor belts for conveying the bags through the working stations of the bag-making device. However, the conveyor belts are exposed to a considerable amount of tensile stress and run the risk of getting stretched. This tendency increases with the decreasing breadth of the conveyor belt. The result of changing the length of the conveyor belt in the operation, however, is that the bag positions in the working stations no longer correctly align with the rotary motions of the tool rollers. The tools run through their machining position when the bag is not yet

or no longer located at the right place and the related working step is executed inaccurately. The resulting fabrication tolerances of the bags can result in serious quality defects in the bags e.g. leakiness and lack of durability. These consequences are highly undesirable.

For these reasons the use of conveyor belts is recommended that have at least components made of tensile-stressable material such as steel. As a rule these components of the belt are coated with a more elastic and softer material that prevents the conveyed items from damage. In this context the so-called cable cord belts must be mentioned that contain steel in their core and are usually coated with rubber.

Unfortunately conveyor belts of the described kind have fabrication tolerances. The result of these fabrication tolerances is once again imprecisions in the positioning of the bags in the machining positions and thus fabrication tolerances of the bags.

Therefore the task of the present invention is to suggest a device that restricts the quality defects that are brought about by the fabrication tolerances of the conveyor belt.

This task is solved thus:

- the drive wheels of the drive system can be driven using lesser angular speed than at least a tool roller and that
- the drive wheels have a larger diameter than the tool rollers.

The present invention makes use of a whole series of surprising findings.
In the use of conveyor belts with components of tensile-stressable material such as steel and a softer protection and/or a softer coating, the conveying

process of the bags is first determined by the tensile-stressable material.

Thus the angular speed of the transport discs and the distance of the tensile-stressable material from the axis of the transport discs are decisive for the conveying speed of the bags in the working stations.
The distance of the tensile-stressable material from the axis of the transport discs is referred to as the effective disc radius in the following. It is composed of the actual radius of the drive wheel and the thickness of the elastic, soft layer between the outer circumference of the transport disc and the tensile-stressable material. However, the thickness of this layer is subject to variations that are transferred to the effective radius of the transport discs and thus to the conveying speed.

These variations are mainly responsible for the imprecisions in the positioning of the bags in the working stations. By the measures in accordance with the invention, the relative portion of the variations in the thickness of the elastic, soft layer between the outer circumference of the transport disc and the tensile-stressable material is reduced to the effective radius of the transport disc and thus to the conveyance speed.

What proves to be particularly advantageous is a configuration in which the ratio of the angular speed of the drive wheels to the angular speed of the processing rollers amounts to 2/3. Due to this ratio of the angular speed of 2/3, the speed droop of the conveyor belt also reduces by the factor 2/3 as compared to when the drive wheels have the same angular speed as the processing rollers.
It is advantageous to provide a drive system that with the help of a bevel gear diverges torque moment for at least one drive wheel from a line shaft (vertical shaft with bevel gears) and transfers it onto the drive wheel via a planetary gear placed underneath.

An example of the design of the invention is presented in the drawings and the objective description.

The individual figures illustrate:

Fig. 1 top view of a cutout of a bag-making device in accordance with the invention

Fig. 2 side view in accordance with II-II in fig. 1

Fig. 3 detailed view of the area circled in fig. 2

Fig. 4 detailed view of a conveyor belt

Fig. 5 gear configuration for the drive wheels in a bag-making device in accordance with the invention.

Fig. 1 illustrates a cutout of a bag-making device in accordance with the invention. The tube sections 1 are conveyed in a laid flat mode in the conveying direction x. The base 2 of the tube sections 1 were formed already. The formation of a bag base is described in e.g. another unpublished patent application of the same applicant with the application number DE 102 55 483. The tube section 1 is held gripped between the conveyor belts 3. As an example of two working stations existing in a bag making device, the base grooving station 30 and the gluing station 31 are described in the following. The tools designed as grooving knives that are attached on the circumference of the grooving rollers 7 of the base grooving station 30, provide the bases 2 of the tube section 1 with a base grooving whereby the back pressure rollers 8 provide the counteracting force. Subsequently an adhesive application in accordance with the format takes place in the gluing station 31 on the bases 2 of the tube sections 1 by the format rollers 9. The back pressure rollers 10 provide the counteracting force required for the adhesive application. All the rollers 7, 8, 9, 10 are supported in a manner that is not illustrated in detail in the machine frame (not illustrated).

The conveyor belt 3 is designed as an endless conveyor and entwines deflection rollers at both the ends of the bag-making device. The drive of the conveyor belt 3 takes place by the drive wheels 4. These are driven by the gears 5 that start from the line gear 12 and that are described in more detail

on the basis of fig. 5. In order to guarantee a sufficient adhesion of the conveyor belt 3 on the drive wheel 4, a deflection disc 6 is each arranged to the right and the left of every drive wheel 4 as can be seen in fig. 2. These deflection discs 6 are pivoted over their bearing pins 11 in the machine frame.

The speed of the conveyor belt 3 and also the conveying speed of the tube sections 1 result from the distance covered per time unit. The distance covered however depends on the distance between the steel cord 13 of the conveyor belt 3 and the axis of the drive wheel 4. This distance is referred to as effective radius R_{eff} in the following. The effective radius R_{eff} is the sum of the radius of the drive wheel 5 and the thickness D of the rubber coat 15 between the steel cord 13 and the surface 17 of the conveyor belt 3. The surface 17 is in direct contact with the outer circumference of the drive wheel 5.

As can be seen in fig. 3 the thickness D has no constant value, instead it varies between the values D_{min} and D_{max}. In other words the distance D is afflicted with an error ΔD that results from the difference between D_{max} and $D_{min.}$ This error that results from the fabrication tolerances of the conveyor belt directly causes speed droops of the conveyor belt 3 and thus deficiencies in the fabrication quality of the cross base bags.

Fig. 4 illustrates a perspective view of the structure of the conveyor belt 3. The conveyor belt 3 essentially consists of several steel cords 13 that are arranged in a horizontal plane and a rubber coat 15 that surrounds the steel cords 13. Since the steel cords 13 have an essentially higher tensile strength as compared to the rubber coat 15, the steel cords 13 determine the so-called ‘neutral phase’ of the conveyor belt 3. This means that the steel cords 13 can neither be compressed nor can they be stretched. Conveyor belts 3 with a structure of such type are referred to in technology as ‘cable cord belts’ and can be

kept narrow due to their tensile strength. They are thus particularly suitable for use in bag making devices that are used to manufacture cross base bags with a small base middle measurement. While using conveyor belts with a lower specific tensile strength, these bag making devices would have to be designed broader in order to receive a comparable tensile strength. The minimum base middle measurement that must be maintained increases accordingly.

Fig. 5 illustrates a view of the gear in accordance with fig. 1. The drive torque is fed to the gear via the line gear 12. The shaft pushes a bevel gear 20 that takes off a part of the torque moment and distributes it onto the planetary gear 21 and the shaft 23. The shaft 23 ends in another bevel gear 20 that deviates the torque moment and delivers it to another planetary gear 21. Both the planetary gears 21 each drive a drive wheel 4. All the gearbox parts 20, 21, 23 are connected to the base plates 18 or to the retaining plates 19, 22 whereby the retaining plates 19, 22 also are firmly connected to the base plates 18. The base plates 18 are attached to the machine frame in a manner not illustrated in more detail.

	List of Reference symbols
1	Tube section
2	Base
3	Conveyor belt
4	drive wheel
5	Gear
6	Deflection disc
7	Grooving roller
8	Back pressure roller
9	Format roller
10	Back pressure roller
11	Bearing pin
12	line gear
13	Steel cord
15	Rubber coat
17	Surface of the rubber coat 15
18	Base plate
19	Retaining plate
20	Bevel gear
21	Planetary gear
22	Retaining plate
23	shaft
30	Base grooving station
31	Gluing station
R_{eff}	Effective radius
D	Thickness of the rubber layer
D_{min}	Minimum thickness of the rubber layer
D_{max}	Maximum thickness of the rubber layer
x	Conveying direction